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Kitajima et al.

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(54) **SINGLE-BEARING REEL**

(71) Applicants: **Shimano Inc.**, Sakai, Osaka (JP); **Shimano Components (Malaysia) SDN. BHD.**, Pontian, Johor (MY)

(72) Inventors: **Keigo Kitajima**, Sakai (JP); **Chun Wee Chew**, Johor (MY); **Muhamad Aidil Bin Misseri**, Johor (MY); **Wen Yin Lee**, Johor (MY)

(73) Assignees: **SHIMANO INC.**, Sakai, Osaka (JP); **SHIMANO COMPONENTS (MALAYSIA) SDN, BHD.**, Pontian, Johor (MY)

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(58) **Field of Classification Search**
CPC A01K 89/016; A01K 89/01908; A01K 89/01928; A01K 89/0193; A01K 89/01931; A01K 89/05; A01K 89/059
See application file for complete search history.

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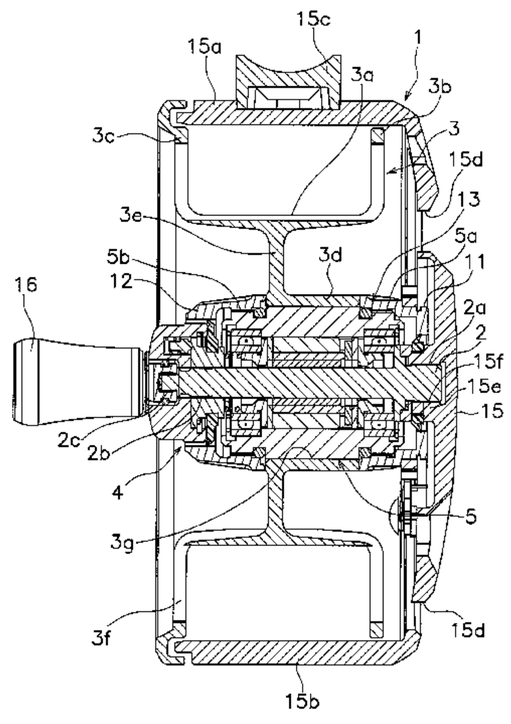
Primary Examiner — Emmanuel M Marcelo

(74) *Attorney, Agent, or Firm* — United IP Counselors, LLC

(57) **ABSTRACT**

A single-bearing reel includes a reel unit, a spool shaft, a support unit, a spool, a first restriction member, a second restriction member, a pair of first seal members, a second seal member, and a third seal member. The pair of first seal members is disposed on an outer peripheral surface of the support unit. One of the pair of first seal members seals between the support unit and the first restriction member. The other of the pair of first seal members seals between the support unit and the second restriction member. The second seal member seals an inner peripheral part of the support unit from an inner peripheral part of the first restriction member. A third seal member seals the inner peripheral part of the support unit from an inner peripheral part of the second restriction member.

16 Claims, 9 Drawing Sheets



(51) **Int. Cl.**
A01K 89/016 (2006.01)
A01K 89/033 (2006.01)

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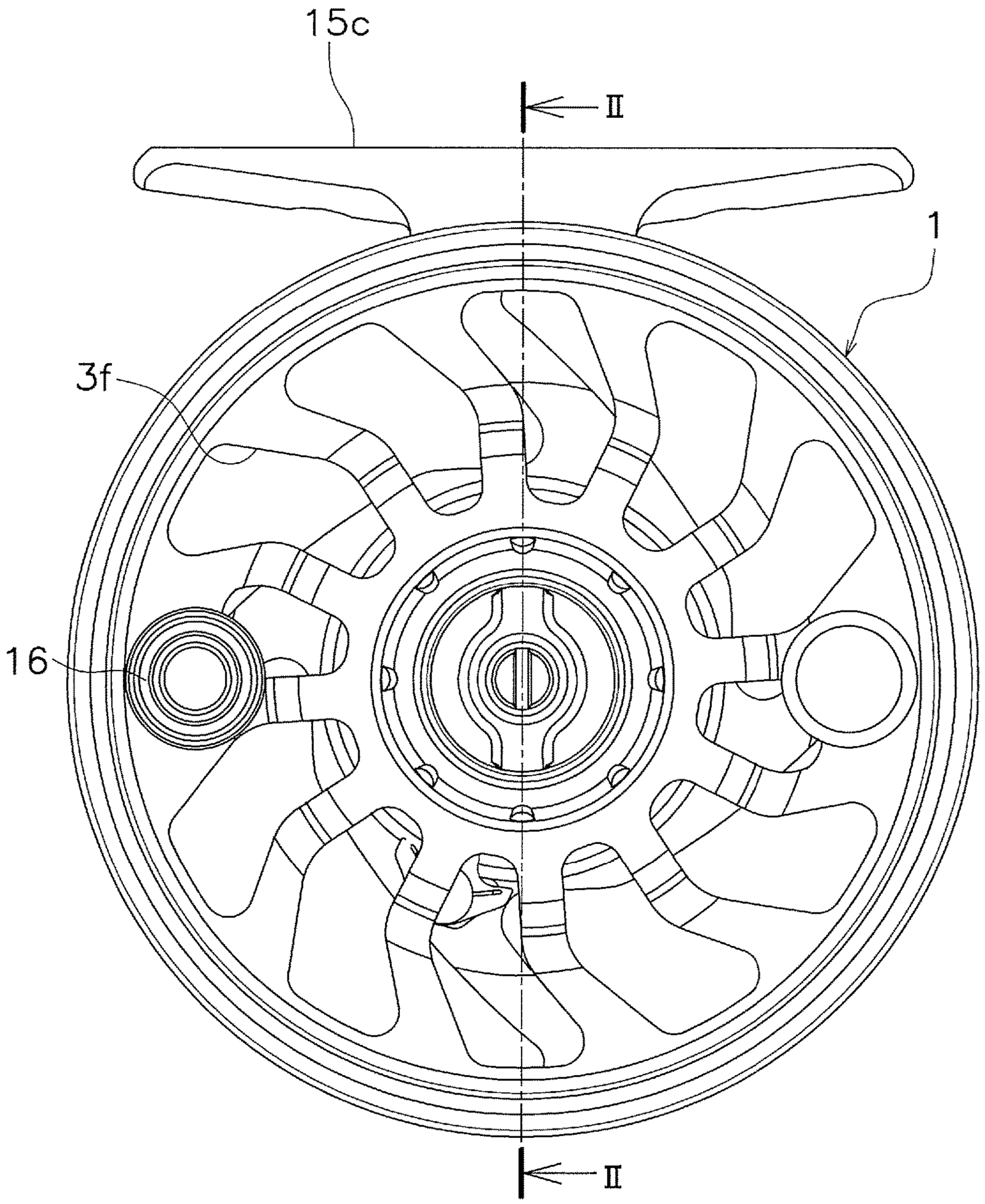

FIG. 1

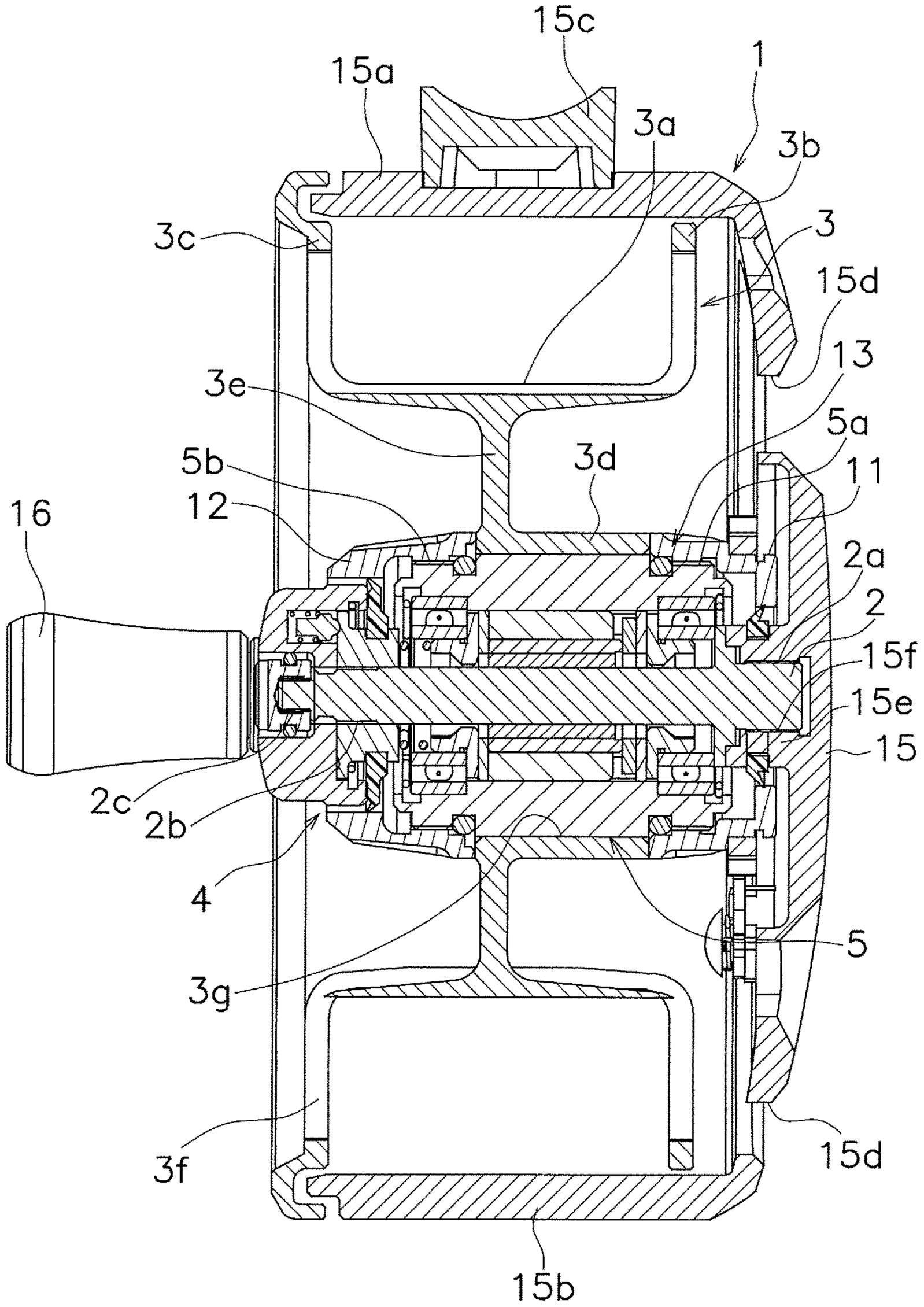
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FIG. 2

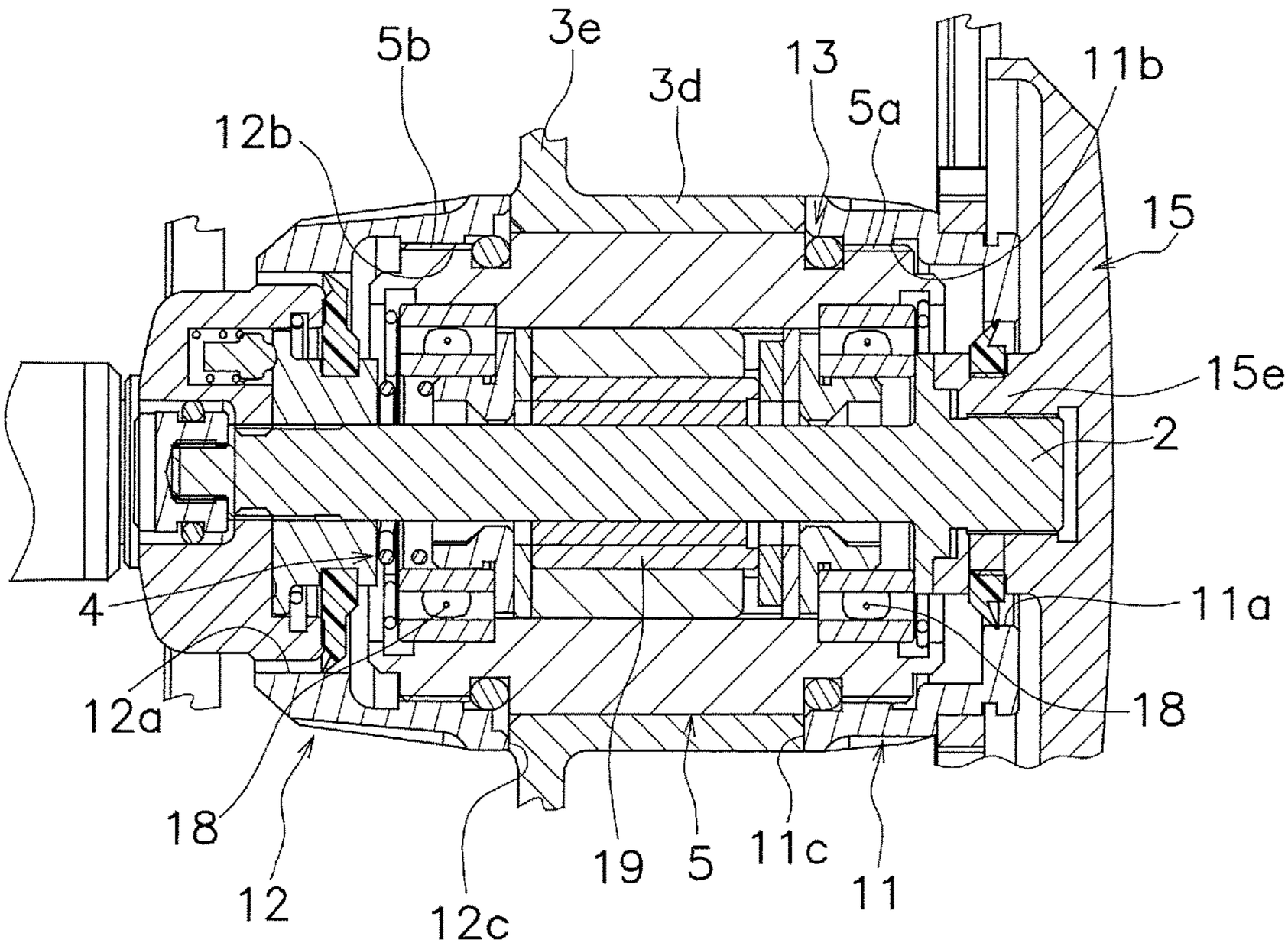
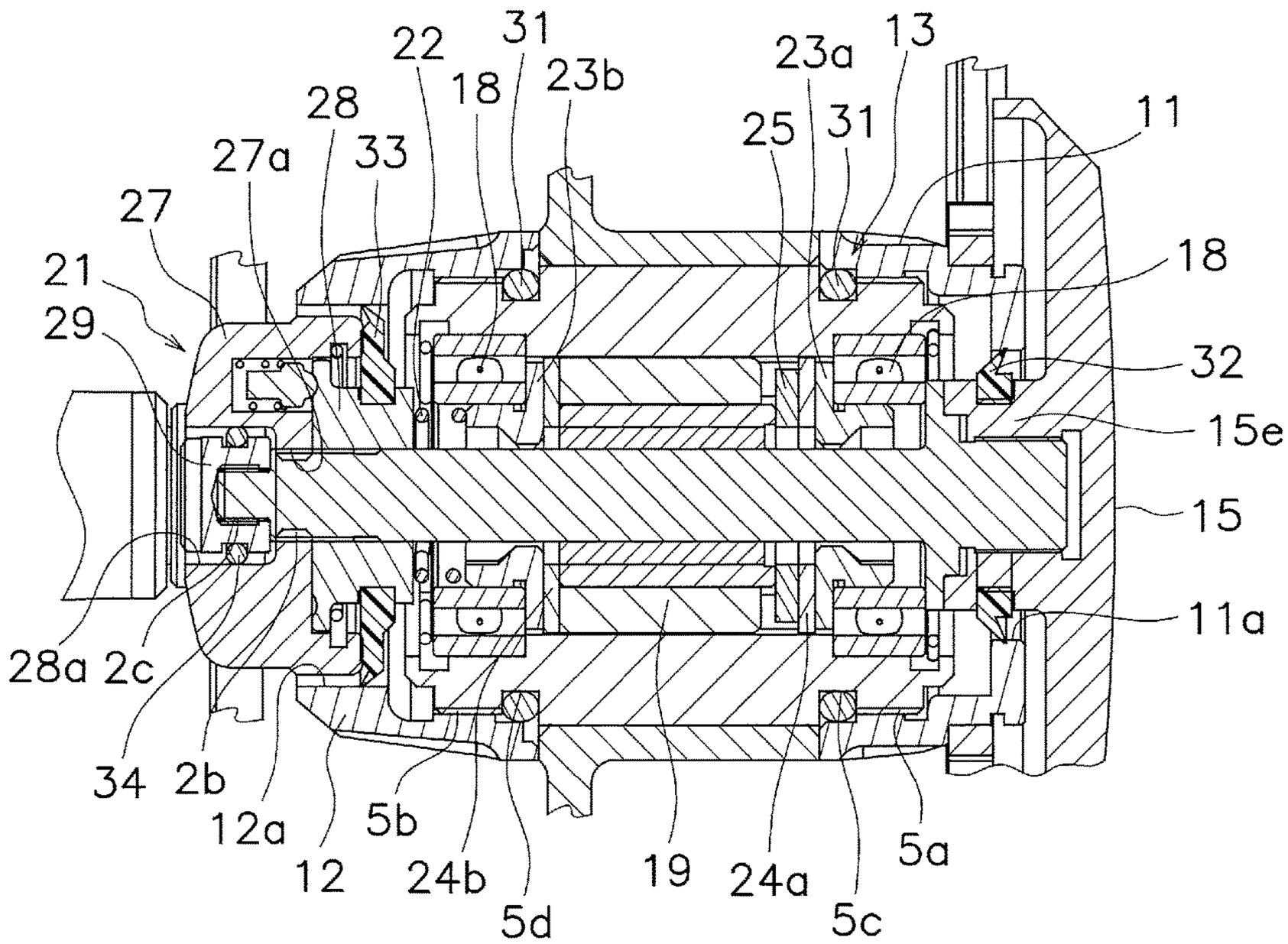


FIG. 3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31
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23b
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32
15e
15
11a
28a
2c
34
2b
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12
5b
24b
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19
24a
5c
5a

FIG. 4

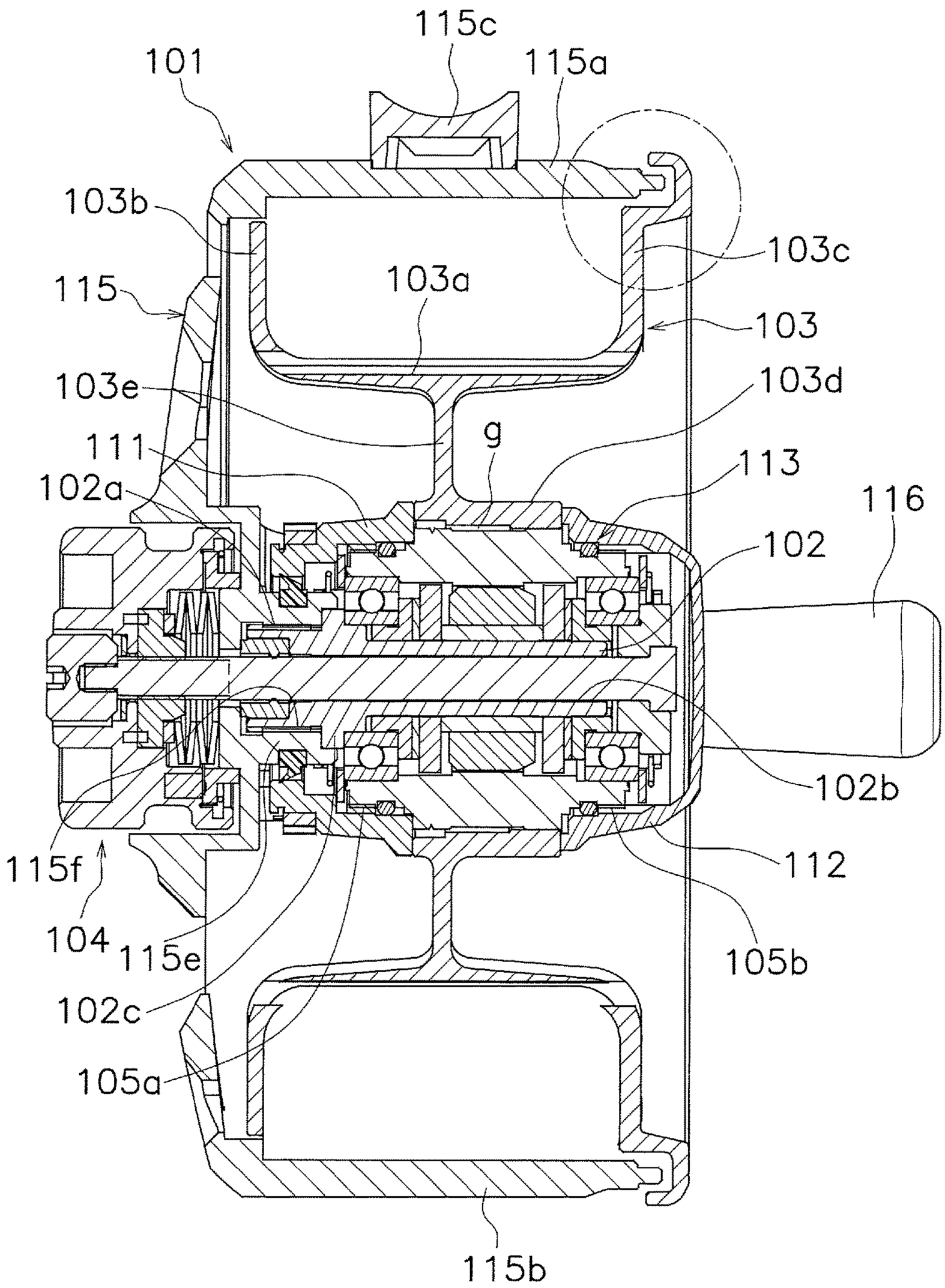
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FIG. 5

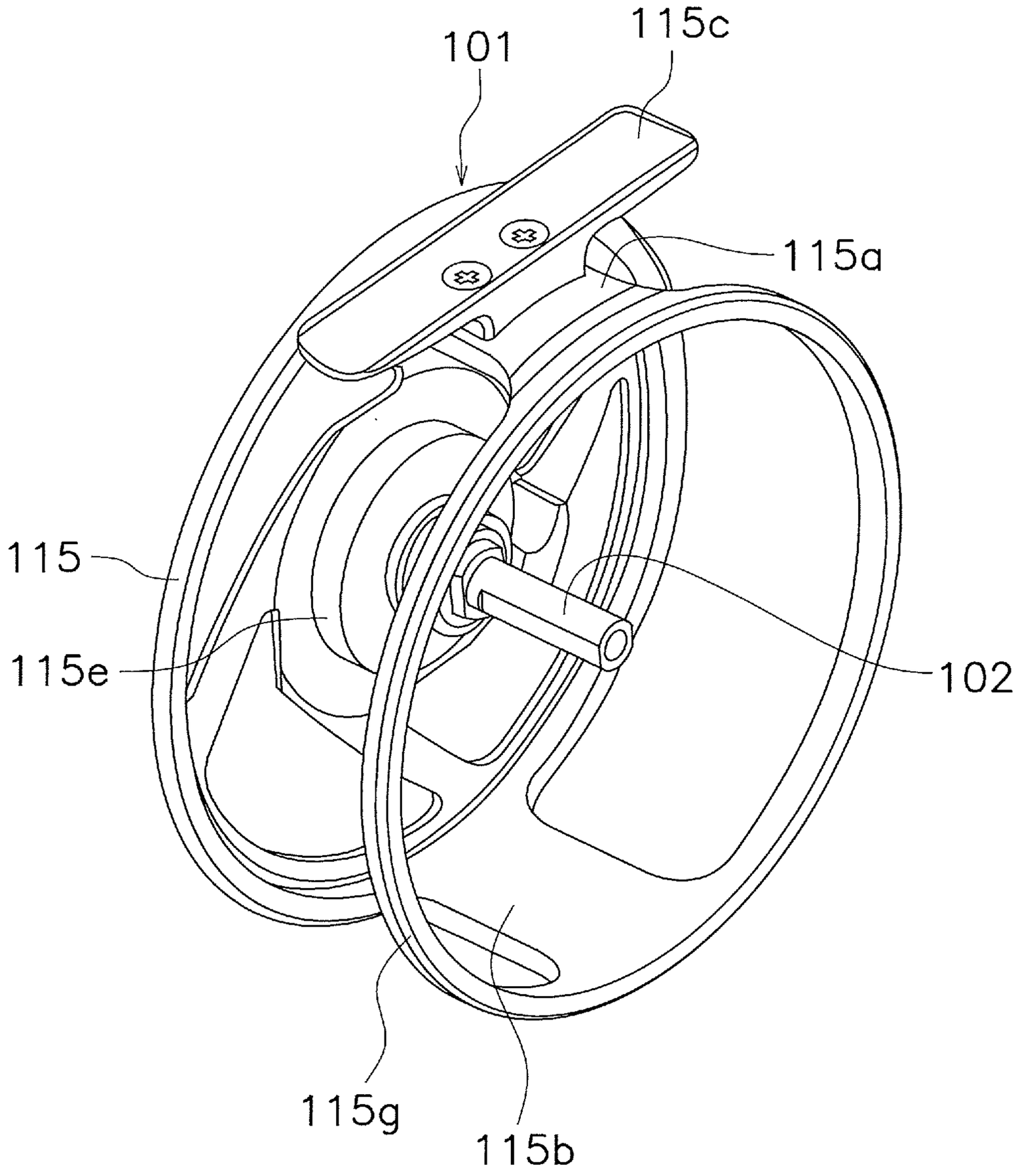

FIG. 6

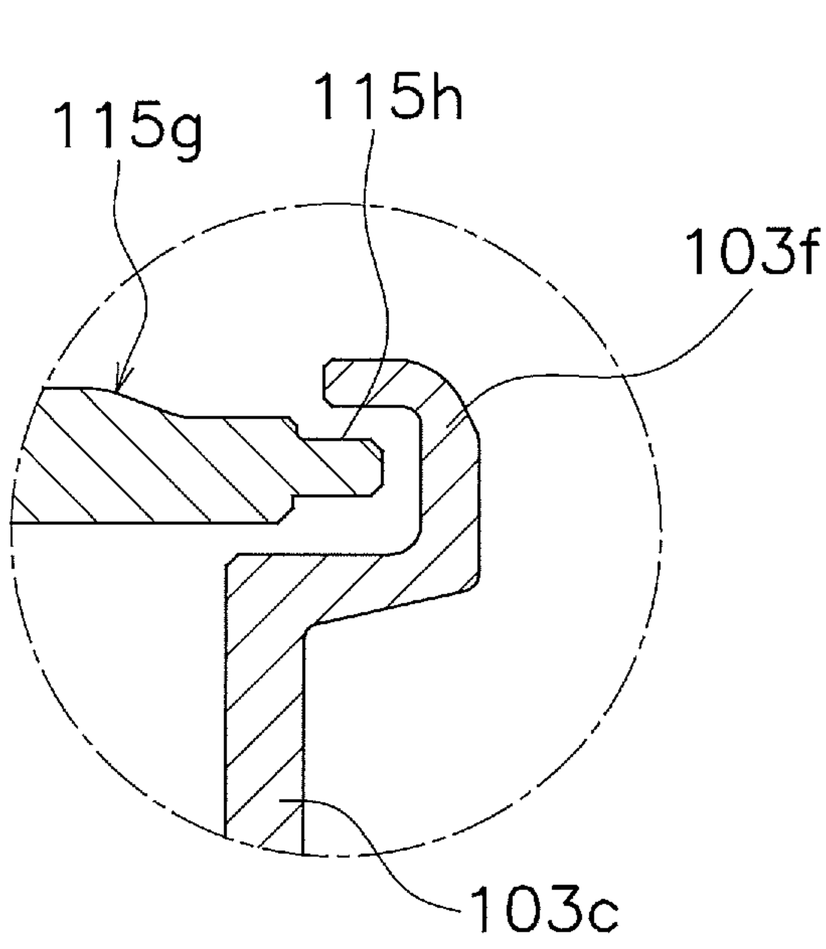

FIG. 7

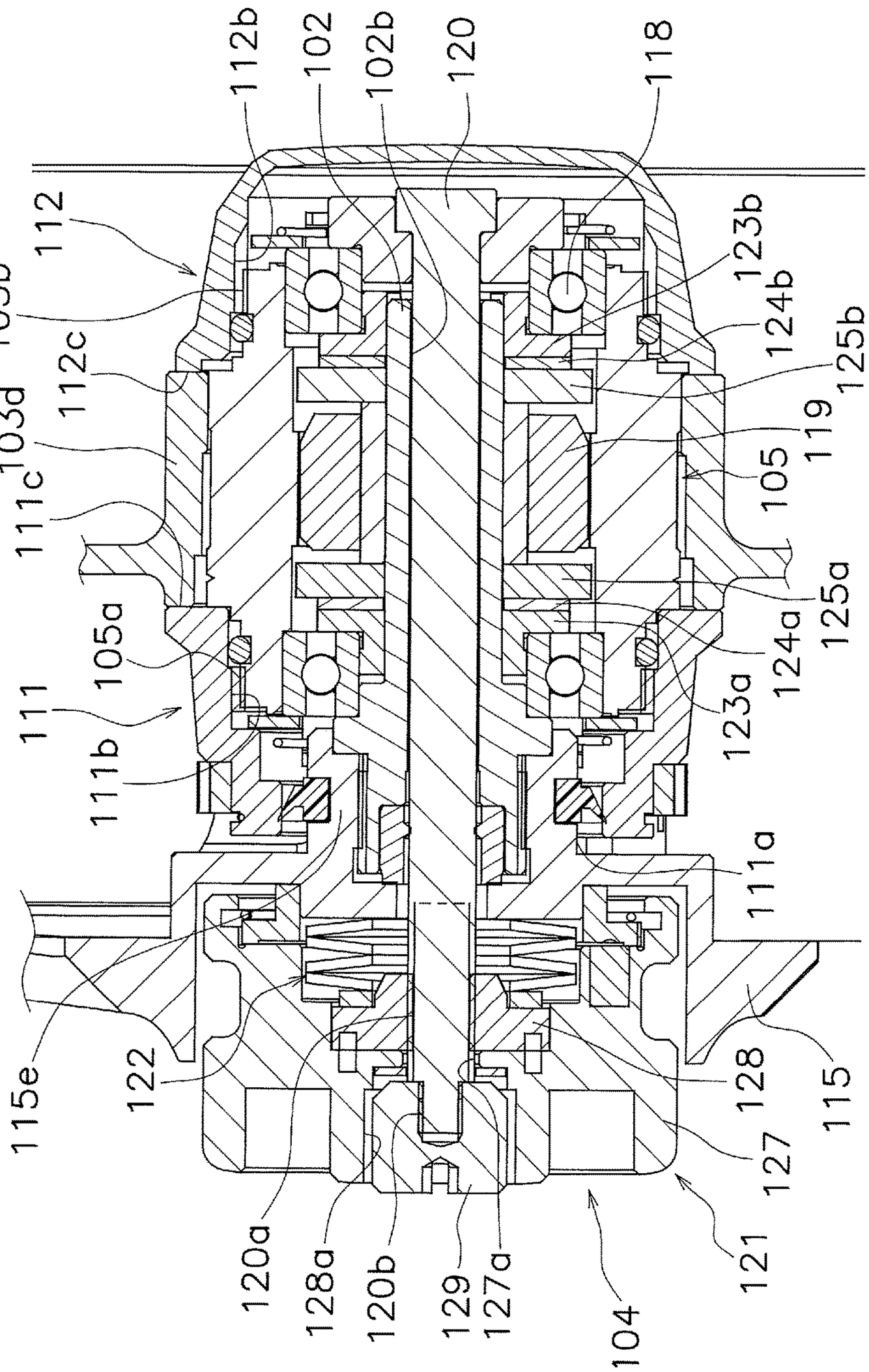
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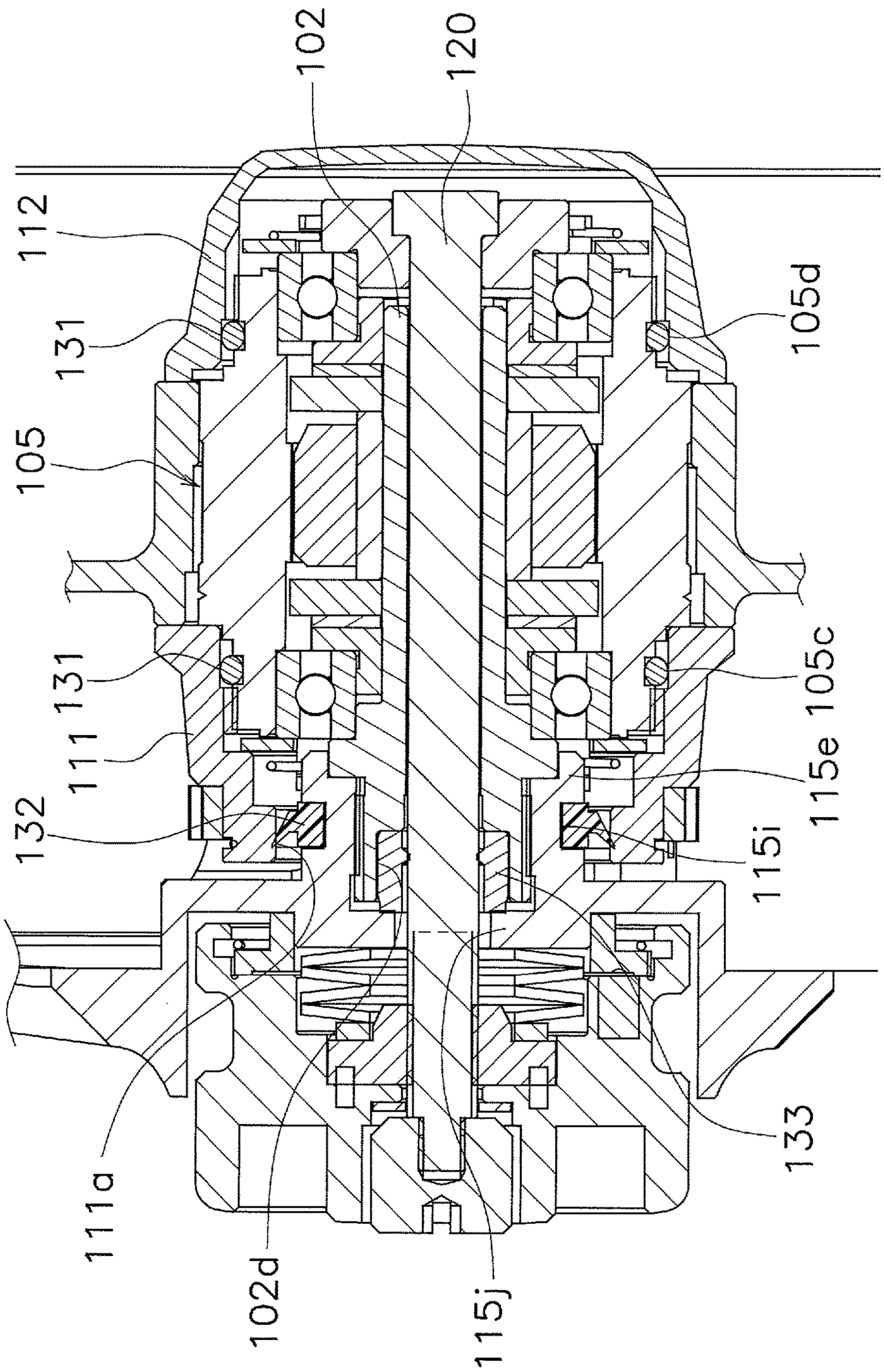
FIG. 8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102d
115j
115i
115e
105c
105d
133

FIG. 9

SINGLE-BEARING REEL

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to Japanese Patent Application No. 2016-110466 filed on Jun. 1, 2016, the entirety of which is hereby incorporated by reference in its entirety.

BACKGROUND

Technical Field

The present disclosure relates to a single-bearing reel.

Background Information

Single-bearing reels are widely used for fly fishing and so forth. For example, a single-bearing reel described in Japan Laid-open Patent Application Publication No. 2002-218881 includes a reel unit, a spool shaft, a spool and a drag mechanism. The spool shaft is supported as a cantilever by the reel unit. The spool is rotatably mounted to the spool shaft through a bearing. Additionally, the spool is provided with a large number of through holes so as to achieve a reduction in the weight of the spool and an enhancement in the aesthetic appearance of the reel unit.

As described above, in the single-bearing reel, the bearing and the drag mechanism are mounted to the interior of the center part of the spool (i.e., in the surroundings of the spool shaft). When water, a foreign object and/or so forth intrude into the interior of the center part of the spool, this can result in degradation in rotational performance of the spool and/or reduction in a braking force of the drag mechanism. Moreover, such intrusion can result in corrosion of members in the surroundings of the spool shaft and/or members composing the drag mechanism.

BRIEF SUMMARY

It is an object of the present disclosure, in a single-bearing reel, to block intrusion of water and/or so forth into the surroundings of a spool shaft so as to enhance durability of the single-bearing reel and simultaneously inhibit degradation in rotational performance of a spool. It is another object of the present disclosure, in a single-bearing reel including a drag mechanism, to inhibit reduction in a braking force of the drag mechanism.

(1) A single-bearing reel according to an aspect of the present disclosure includes a reel unit, a spool shaft, a support unit having a tubular shape, a spool, a first restriction member having an annular shape, a second restriction member having an annular shape, a pair of first seal members, a second seal member and a third seal member. The reel unit includes a shaft support part. The spool shaft is supported as a cantilever by the shaft support part. The support unit is rotatable with respect to the spool shaft. The spool is mounted to the support unit. The spool is rotatable with respect to the spool shaft. A fishing line can be wound about an outer periphery of the spool. The first restriction member enables the spool shaft to penetrate through the first restriction member. The first restriction member is at least partially mounted to an outer peripheral part of the support unit on one end side of the support unit. The first restriction member restricts the spool from moving in an axial direction. The second restriction member enables the spool shaft to penetrate through the second restriction member. The second restriction member is at least partially mounted to the outer peripheral part of the support unit on the other end side of the support unit. The second restriction member restricts the spool from moving in the axial direction. The pair of first seal members is disposed on an outer peripheral surface of the support unit. One of the pair of first seal members seals between the support unit and the first restriction member, whereas the other of the pair of first seal members seals between the support unit and the second restriction member. The second seal member blocks intrusion of water into an inner peripheral part of the support unit from an inner peripheral part of the first restriction member. The third seal member blocks intrusion of the water into the inner peripheral part of the support unit from an inner peripheral part of the second restriction member.

In the present single-bearing reel, the first to third seal members are disposed between the support unit and the other members. Therefore, it is possible to block intrusion of water into the surroundings of the spool shaft in the inner peripheral part of the support unit. Hence, it is possible to enhance durability of the reel, and simultaneously, inhibit degradation in rotational performance of the spool.

(2) The single-bearing reel can further include a drag mechanism. The drag mechanism includes a drag knob for adjusting a drag force. The drag knob is disposed on an inner peripheral side of the second restriction member. Additionally, the third seal member can seal between the inner peripheral part of the second restriction member and an outer peripheral part of the drag knob.

In this construction, it is possible to block intrusion of water into the surroundings of the drag mechanism. Hence, it is possible not only to achieve advantageous effects similar to those described above but also to inhibit reduction in a braking force of the drag mechanism.

(3) A single-bearing reel according to another aspect of the present disclosure includes a reel unit, a spool shaft, a support unit having a tubular shape, a spool, a drag shaft, a first restriction member having an annular shape, a second restriction member having a closed-end cylindrical shape, a pair of first seal members, a second seal member and a third seal member. The reel unit includes a shaft support part. The spool shaft is supported as a cantilever by the shaft support part. The support unit is rotatable with respect to the spool shaft. The spool is mounted to the support unit. The spool is rotatable with respect to the spool shaft. A fishing line can be wound about an outer periphery of the spool. The drag shaft is disposed to penetrate an interior of the shaft support part and an interior of the spool shaft. The first restriction member enables the spool shaft to penetrate through the first restriction member. The first restriction member is at least partially mounted to an outer peripheral part of the support unit on one end side of the support unit. The first restriction member restricts the spool from moving in an axial direction. The second restriction member is at least partially mounted to the outer peripheral part of the support unit on the other end side of the support unit. The second restriction member restricts the spool from moving in the axial direction. The pair of first seal members is disposed on an outer peripheral surface of the support unit. One of the pair of first seal members seals between the support unit and the first restriction member, whereas the other of the pair of first seal members seals between the support unit and the second restriction member. The second seal member blocks intrusion of water into an inner peripheral part of the support unit from an inner peripheral part of the first restriction member.

The third seal member seals between an inner peripheral part of the spool shaft and an outer peripheral part of the drag shaft.

The present single-bearing reel is provided with the first to third seal members, whereby it is possible to block intrusion of sea water and/or so forth into the spool shaft and the surroundings of the drag mechanism. Hence, it is possible to enhance durability of the reel, and simultaneously, inhibit degradation in rotational performance of the spool and reduction in a braking force of the drag mechanism.

(4) The second seal member can seal between the inner peripheral part of the first restriction member and an outer peripheral part of the shaft support part.

(5) The spool can include a boss having a tubular shape. The support unit can be inserted into an interior of the boss. The boss can be interposed between the first restriction member and the second restriction member and can be restricted from moving in the axial direction.

(6) The pair of first seal members can be a pair of O-rings.

(7) The support unit can include a pair of bearings and a roller clutch. The pair of bearings supports the spool shaft. The roller clutch is disposed between the pair of bearings, and transmits or blocks rotation of the spool in accordance with a rotational direction of the spool.

In this construction, it is possible to block intrusion of water into a part in which the pair of bearings and the roller clutch are disposed. Hence, it is possible to enhance durability of the reel, and simultaneously, inhibit degradation in rotational performance of the spool.

Overall, according to the present disclosure, it is possible to block intrusion of water and/or so forth into the surroundings of the spool shaft in the single-bearing reel. Hence, it is possible to enhance durability of the single-bearing reel, and simultaneously, inhibit degradation in rotational performance of the spool. Additionally, when the single-bearing reel is designed to include the drag mechanism, it is possible to inhibit reduction in a braking force of the drag mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring now to the attached drawings which form a part of this original disclosure:

FIG. **1** is a side view of a single-bearing reel according to a first preferred embodiment of the present disclosure;

FIG. **2** is a cross-sectional view of the single-bearing reel shown in FIG. **1** taken along line II-II;

FIG. **3** is an enlarged partial view of FIG. **2**;

FIG. **4** is an enlarged partial view of FIG. **2**;

FIG. **5** is a diagram according to a second preferred embodiment of the present disclosure and corresponds to FIG. **2**;

FIG. **6** is an external perspective view of a reel unit of a single-bearing reel according to the second preferred embodiment of the present disclosure;

FIG. **7** is an enlarged partial view of FIG. **5**;

FIG. **8** is an enlarged partial view of FIG. **5**; and

FIG. **9** is an enlarged partial view of FIG. **5**.

DETAILED DESCRIPTION OF EMBODIMENTS

First Preferred Embodiment

FIGS. **1** and **2** are a side view and a cross-sectional view of a single-bearing reel employing a first preferred embodiment of the present disclosure, respectively. It should be noted that in the following explanation, the term "first side" refers to the right side in FIG. **2** whereas the term "second side" refers to the left side in FIG. **2**.

The present single-bearing reel includes a reel unit **1**, a spool shaft **2**, a spool **3** and a drag mechanism **4**. The spool shaft **2** is supported as a cantilever by the reel unit **1**. The spool **3** is rotatably mounted to the spool shaft **2**, and a fishing line can be wound about the outer periphery of the spool **3**. The drag mechanism **4** brakes the spool **3** when the spool **3** is rotated in one direction.

Additionally, a support unit **5**, having a tubular shape, is mounted between the spool shaft **2** and the inner peripheral part of the spool **3**. A first restriction member **11** is disposed on the first side of the support unit **5**, whereas a second restriction member **12** is disposed on the second side (opposite to the first side) of the support unit **5**. Additionally, a seal mechanism **13** is provided for blocking intrusion of water and/or so forth into the interior of the support unit **5**.

The reel unit **1** includes a side plate **15** having a disc shape on the first side. However, the reel unit **1** is opened on the second side. The side plate **15** is provided with an upper protection part **15***a* and a lower protection part **15***b* on an outer periphery of the side plate **15**. The upper and lower protection parts **15***a* and **15***b* extend in an axial direction and are opposed to each other in an up-and-down direction. The upper protection part **15***a* is provided with an attachment part **15***c* for attaching the reel unit **1** to a fishing rod through the attachment part **15***c*. The side plate **15** is provided with a plurality of (herein, four) openings **15***d* aligned at intervals in a circumferential direction. The side plate **15** is provided with a shaft support part **15***e* on a center part of the side plate **15** so as to fix the spool shaft **2** to the side plate **15**. The shaft support part **15***e* is an example of a shaft supporting means. The shaft support part **15***e* is provided with a female threaded part **15***f* in a center part of the shaft support part **15***e*.

The spool shaft **2** is provided with a first male threaded part **2***a* on a first end of the spool shaft **2**. The spool shaft **2** is screwed and fixed to the center part of the side plate **15** by screwing the first male threaded part **2***a* into the female threaded part **15***f* of the shaft support part **15***e*. The spool shaft **2** is provided with a second male threaded part **2***b* and a third male threaded part **2***c* on a second end of the spool shaft **2**. The diameter of the second male threaded part **2***b* is approximately equal to that of the middle part of the spool shaft **2**. The third male threaded part **2***c* further protrudes from the second male threaded part **2***b* in the axial direction. The diameter of the third male threaded part **2***c* is smaller than that of the second male threaded part **2***b*.

The spool **3** is disposed in the interior of the reel unit **1**. The spool **3** includes a bobbin trunk **3***a*, an inner flange **3***b*, an outer flange **3***c*, a boss **3***d*, and a coupling part **3***e* connecting the bobbin trunk **3***a* and the boss **3***d*. These constituent elements of the spool **3** are integrated. The bobbin trunk **3***a*, the inner flange **3***b*, the outer flange **3***c* and the coupling part **3***e* are provided with a plurality of through holes **3***f* for reducing the weight of the spool **3** and enhancing the aesthetic appearance of the reel unit **1**. The through holes **3***f* are an example of a weight reducing means.

The bobbin trunk **3***a* has a cylindrical shape, and the fishing line is wound onto an outer peripheral surface of the bobbin trunk **3***a*. The inner flange **3***b* protrudes from the first end of the bobbin trunk **3***a* to the outer peripheral side. The inner flange **3***b* is disposed in opposition to the side plate **15** of the reel unit **1**. The outer flange **3***c* protrudes from the second end of the bobbin trunk **3***a* to the outer peripheral side. The outer flange **3***c* is disposed in opposition to the inner flange **3***b*. The diameter of the outer flange **3***c* is larger

than that of the inner flange **3***b*. The outer flange **3***c* is disposed to cover the opened part of the reel unit **1**. A handle **16** is attached to the lateral surface of the outer flange **3***c*. The handle **16** is provided for enabling a rotational operation of the spool **3**. The boss **3***d* is a tubular member provided with a through hole **3***g* extending in the axial direction. The boss **3***d* extends only to the first side from the inner peripheral end of the coupling part **3***e*.

The support unit **5** has a tubular shape and a center of the support unit **5** is penetrated by the spool shaft **2**. The support unit **5** is accommodated in the inner peripheral part of the boss **3***d*. An axially extending lock protrusion (not shown in the drawings) is provided on the outer peripheral surface of the support unit **5**. The axially extending lock protrusion is engaged with an axially extending lock groove (not shown in the drawings) provided on the inner peripheral surface of the boss **3***d*. With this construction, the support unit **5** is detachably (axially movably) attached to the boss **3***d* but is non-rotatable with respect to the boss **3***d*. Additionally, the support unit **5** is provided with a pair of male threaded parts **5***a* and **5***b* on both ends of an outer peripheral surface of the support unit **5**.

As shown in an enlarged view of FIG. **3**, the first restriction member **11** is disposed on the first side of the support unit **5**, whereas the second restriction member **12** is disposed on the second side of the support unit **5**. The first and second restriction members **11** and **12** are approximately cylindrical members, and are provided with circular openings **11***a* and **12***a* penetrated by the spool shaft **2**, respectively. Additionally, parts (inner parts) of the first and second restriction members **11** and **12** are disposed on the outer peripheral side of the male threaded parts **5***a* and **5***b* of the support unit **5**, respectively. These parts of the first and second restriction members **11** and **12** are provided with female threaded parts **11***b* and **12***b* on their inner peripheral surfaces, respectively. The female threaded parts **11***b* and **12***b* are engaged with the pair of male threaded parts **5***a* and **5***b*.

The first restriction member **11** makes contact at an end surface **11***c* (the second side one of the end surfaces of the first restriction member **11**) with the tip of the boss **3***d* of the spool **3**. The first restriction member **11** is an example of a first restricting means. On the other hand, the second restriction member **12** makes contact at an end surface **12***c* (the first side one of the end surfaces of the second restriction member **12**) with the inner peripheral end of the coupling part **3***e* (the base end of the boss **3***d*) of the spool **3**. The second restriction member **12** is an example of a second restricting means. Thus, the spool **3** is restricted from moving in the axial direction, while the boss **3***d* of the spool **3** is interposed between the first restriction member **11** and the second restriction member **12**.

As shown in FIG. **3**, the support unit **5** includes a pair of bearings **18** and a roller clutch **19** in an internal space of the support unit **5**. The bearings **18** support the spool **3** such that the spool **3** is rotatable with respect to the spool shaft **2**. The roller clutch **19** operates only when the spool **3** is rotated with respect to the spool shaft **2** in a fishing line releasing direction. The support unit **5** is an example of a spool supporting means.

The drag mechanism **4** will be explained with FIG. **4**. The drag mechanism **4** includes a drag knob **21**, a coil spring **22**, a pair of bearing support members **23***a* and **23***b*, a pair of drag washers **24***a* and **24***b*, and a key washer **25**.

The drag knob **21** includes a rotor **27** and a slider **28**. The rotor **27** is provided with a female threaded part **27***a* in a center part of the rotor **27**. The female threaded part **27***a* is screwed onto the second male threaded part **2***b* of the spool shaft **2**. The slider **28** is provided with a through hole in a center part of the slider **28**. The through hole is penetrated by the spool shaft **2**. The slider **28** is mounted to the rotor **27** while being axially immovable and rotatable relatively to the rotor **27**. Additionally, the slider **28** is axially movable along the outer peripheral surface of the spool shaft **2** in conjunction with rotation of the rotor **27**.

It should be noted that the rotor **27** is provided with a recess **28***a* in a center part of the rotor **27** so as to dispose a fixation screw member **29** in the recess **28***a*. The fixation screw member **29** is screwed onto the third male threaded part **2***c* of the spool shaft **2**. The fixation screw member **29** prevents the drag knob **21** from being detached from the spool shaft **2**.

Each of the pair of bearing support members **23***a* and **23***b* includes a tubular part and a flange. The tubular part supports each bearing **18**. The flange has a disc shape and extends from one end of the tubular part to the outer peripheral side. Additionally, the drag washer **24***a* and the key washer **25** are disposed between the roller clutch **19** and one of the bearing support members **23***a* and **23***b* (i.e., the bearing support member **23***a*). On the other hand, the drag washer **24***b* is disposed between the roller clutch **19** and the other of the bearing support members **23***a* and **23***b* (i.e., the bearing support member **23***b*). Moreover, the coil spring **22** is disposed between an end surface of the slider **28** of the drag knob **21** and an end surface of the tubular part of the bearing support member **23***b*.

With the aforementioned construction, a drag force is adjustable by axially moving the slider **28** in conjunction with rotation of the drag knob **21**. The drag knob **21** is an example of a drag adjusting means.

Next, the seal mechanism **13** will be explained with FIG. **4**. The seal mechanism **13** includes a pair of O-rings **31** (first seal member), a second seal member **32**, a third seal member **33** and a fourth seal member **34**. The seal members will be hereinafter explained in detail.

The support unit **5** is provided with annular grooves **5***c* and **5***d* on an outer peripheral surface of the support unit **5**. Each annular groove **5***c*, **5***d* is located on the inner side of each male threaded part **5***a*, **5***b*. Additionally, the pair of O-rings **31** is disposed while being interposed between the annular grooves **5***c* and **5***d* and the inner peripheral surfaces of the first and second restriction members **11** and **12**, respectively. With this construction, water and/or so forth are blocked from intruding into the support unit **5** through gaps between the inner peripheral parts of the first and second restriction members **11** and **12** and the outer peripheral part of the support unit **5**. The pair of O-rings **31** is an example of a first sealing means.

The second seal member **32** is mounted to the outer peripheral surface of the shaft support part **15***e* of the side plate **15**. The second seal member **32** seals between the opening **11***a* of the first restriction member **11** and the outer peripheral surface of the shaft support part **15***e*. Accordingly, water and/or so forth are blocked from intruding into the support unit **5** through the opening **11***a* of the first restriction member **11**. The second seal member **32** is an example of a second sealing means.

The third seal member **33** is mounted to the outer peripheral surface of the slider **28** of the drag knob **21**. The third seal member **33** seals between the opening **12***a* of the second restriction member **12** and the outer peripheral surface of the slider **28**. Accordingly, water and/or so forth are blocked from intruding into the support unit **5** through the opening

12*a* of the second restriction member **12**. The third seal member **33** is an example of a third sealing means.

The fourth seal member **34** is mounted to the outer peripheral surface of the fixation screw member **29**. The fourth seal member **34** seals between the outer peripheral part of the fixation screw member **29** and the inner peripheral surface of the recess **28***a* provided on the rotor **27** of the drag knob **21**. Accordingly, water and/or so forth are blocked from intruding into the support unit **5** from the inner peripheral part of the drag knob **21** through the outer peripheral surface of the spool shaft **2**.

In the aforementioned single-bearing reel, when the fishing line is wound about the spool **3**, the handle **16** is operated to rotate the spool **3**. The spool **3** is rotated relatively to the spool shaft **2**. At this time, the spool **3** is rotated in a fishing line winding direction by the roller clutch **19**, and is therefore smoothly rotated.

When the fishing line is released from the spool **3**, the spool **3** is rotated reversely to the fishing line winding direction. At this time, the roller clutch **19** is turned on. Hence, the drag mechanism **4** operates whereby rotation of the spool **3** is braked in accordance with an adjusted magnitude of drag force.

In the present preferred embodiment, the fishing line winding direction can be reversely changed by oppositely changing the attachment direction of the roller clutch **19**, i.e., the attachment direction of the support unit **5**. In this case, the second restriction member **12** is firstly detached, and then, the spool **3** is detached from the support unit **5**. Next, the fixation screw member **29** is detached from the spool shaft **2**, and the drag knob **21** is detached from the spool shaft **2**. Subsequently, the support unit **5** is detached from the spool shaft **2**, and then, the first restriction member **11** is detached from the support unit **5**. The first and second restriction members **11** and **12** engage with the pair of the male threaded parts **5***a* and **5***b* of the support unit **5**. Hence, the attachment direction of the support unit **5** is oppositely changed, and then, the first restriction member **11** is attached to the support unit **5**. With this procedure, the attachment direction of the roller clutch **19** can be easily changed oppositely. The attachment procedure to be hereinafter performed is only different from the detachment procedure in that the steps of the attachment procedure are performed reversely to those of the detachment procedure. Hence, its explanation will not be hereinafter explained.

Second Preferred Embodiment

FIG. **5** is a cross-sectional view of a single-bearing reel employing a second preferred embodiment of the present disclosure. It should be noted that in the second preferred embodiment, the term "first side" refers to the left side in FIG. **5** whereas the term "second side" refers to the right side in FIG. **5**. Thus, these term settings are reversed from those of the first preferred embodiment.

Similarly to the first preferred embodiment, the single-bearing reel includes a reel unit **101**, a spool shaft **102**, a spool **103** and a drag mechanism **104**. The spool shaft **102** is supported as a cantilever by the reel unit **101**. The spool **103** is rotatably mounted to the spool shaft **102** so as to wind a fishing line about an outer periphery of the spool **103**. The drag mechanism **104** brakes the spool **103** when the spool **103** is rotated in one direction.

Additionally, a support unit **105**, having a tubular shape, is mounted between the spool shaft **102** and the inner peripheral part of the spool **103**. A first restriction member **111** is disposed on the first side of the support unit **105**, whereas a second restriction member **112** is disposed on the second side (opposite to the first side) of the support unit **105**. Additionally, a seal mechanism **113** is provided for blocking intrusion of water and/or so forth into the interior of the support unit **105**.

The construction of the reel unit **101** is basically the same as that of the reel unit **1** of the first preferred embodiment. In other words, the reel unit **101** includes a side plate **115** having a disc shape on the first side. However, the reel unit **101** is opened on the second side. Additionally, the side plate **115** is provided with an upper protection part **115***a* and a lower protection part **115***b* on an outer periphery of the side plate **115**. The upper protection part **115***a* is provided with an attachment part **115***c*. Moreover, the side plate **115** is provided with a shaft support part **115***e* on a center part of the side plate **115** so as to fix the spool shaft **102** to the side plate **115**. The shaft support part **115***e* is another example of a shaft supporting means. The shaft support part **115***e* is provided with a female threaded part **115***f* in a center part of the shaft support part **115***e*. It should be noted that as is obvious from a perspective view of FIG. **6**, unlike the reel unit **1** of the first preferred embodiment, the reel unit **101** of the second preferred embodiment is provided with an annular part **115***g* on a side facing the side plate **115**. The annular part **115***g* and the outer peripheral part of the side plate **115** are connected through the upper protection part **115***a* and the lower protection part **115***b*.

The spool shaft **102** is provided with a male threaded part **102***a* on a first end of the spool shaft **102**. The spool shaft **102** is screwed and fixed to the center part of the side plate **115** by screwing the first male threaded part **102***a* into the female threaded part **115***f* of the shaft support part **115***e*. The spool shaft **102** is provided with a through hole **102***b* in a center part of the spool shaft **102**. The through hole **102***b* penetrates the spool shaft **102** in the axial direction. It should be noted that an annular brim **102***c* is provided on a part of the spool shaft **102**. The annular brim **102***c* contacts the tip end of the shaft support part **115***e* of the reel unit **101**.

The spool **103** is disposed in the interior of the reel unit **101**. The construction of the spool **103** is similar to that of the spool **3** of the first preferred embodiment. In other words, the spool **103** includes a bobbin trunk **103***a*, an inner flange **103***b*, an outer flange **103***c*, a boss **103***d* and a coupling part **103***e*. Additionally, a handle **116** is attached to the lateral surface of the outer flange **103***c*.

It should be noted that in the present preferred embodiment, only part of the inner peripheral surface of the boss **103***d* contacts the outer peripheral surface of the support unit **105**, whereas a gap g is produced between the other part of the inner peripheral surface of the boss **103***d* and the outer peripheral surface of the support unit **105**. This construction is made for easily detaching the spool **103** from the support unit **105**.

FIG. **7** shows an enlarged view of the annular part **115***g* of the reel unit **101** and the outer peripheral part of the spool **103**. A tip end **115***h* of the annular part **115***g* has a radial thickness thinner than that of the other part of the annular part **115***g*. On the other hand, the outer flange **103***c* of the spool **103** is provided with a groove part **103***f* protruding from an outer peripheral part to the further outer peripheral side of the outer flange **103***c*. The groove part **103***f* has a cross-section made in the shape of a square C opened to the first side. Additionally, the tip end **115***h* of the annular part **115***g* of the reel unit **101** is inserted into the groove part **103***f*.

With the aforementioned construction, the tip end **115***h* inserted into the groove part **103***f* is unlikely to make contact with the groove part **103***f*. This can be specifically expressed

as follows. When a thumbing operation is performed or when the tension of the fishing line is large, the spool **103** is likely to tilt. However, even when the spool **103** tilts, the spool **3** and the reel unit **101** are unlikely to contact each other.

Similarly to the support unit **5** according to the first preferred embodiment, the support unit **105** has a tubular shape, and is accommodated in the inner peripheral part of the boss **103***d* while being penetrated by the spool shaft **2**. The support unit **105** is detachably (axially movably) attached to the boss **103***d* but is non-rotatable with respect to the boss **103***d*. Additionally, the support unit **105** is provided with a pair of male threaded parts **105***a* and **105***b* on both ends of an outer peripheral surface of the support unit **105**.

As shown in an enlarged view of FIG. **8**, the first restriction member **111** is an approximately cylindrical member, and is provided with a circular opening **111***a* in a center part of the first restriction member **111**. Additionally, a part (inner part) of the first restriction member **111** is disposed on the outer peripheral side of the male threaded part **105***a* of the support unit **105**. This part of the first restriction member **111** is provided with a female threaded part **111***b* on an inner peripheral surface of the first restriction member **111**. The female threaded part **111***b* is engaged with the male threaded part **105***a*. The first restriction member **111** is another example of the first restricting means.

The second restriction member **112** is a member made in the shape of a closed-end cylinder, i.e., a cap. A part (inner part) of the second restriction member **112** is disposed on the outer peripheral side of the male threaded part **105***b* of the support unit **105**. This part of the second restriction member **112** is provided with a female threaded part **112***b* on an inner peripheral surface of the second restriction member **112**. The female threaded part **112***b* is engaged with the male threaded part **105***b*. The second restriction member **112** is another example of a second restricting means.

Similarly to the first preferred embodiment, the spool **103** is restricted from moving in the axial direction, while the boss **103***d* is interposed between an end surface **111***c* (second side end surface) of the first restriction member **111** and an end surface **112***c* (first side end surface) of the second restriction member **112**.

Additionally, a pair of bearings **118** and a roller clutch **119** are disposed in the internal space of the support unit **105**. This construction is similar to that of the first preferred embodiment. The support unit **105** is another example of a spool supporting means.

The drag mechanism **104** includes a drag shaft **120**, a drag knob **121**, disc springs **122**, a pair of bearing support members **123***a* and **123***b*, a pair of drag washers **124***a* and **124***b*, and a pair of key washers **125***a* and **125***b*.

The drag shaft **120** is non-rotatably mounted to the spool shaft **102** while penetrating the shaft support part **115***e* and the through hole **102***b* of the spool shaft **102**. The drag shaft **120** is provided with a first male threaded part **120***a* on a first side end of the drag shaft **120**. The drag shaft **120** is further provided with a second male threaded part **120***b* on the tip end of the first male threaded part **120***a*. The second male threaded part **120***b* has a smaller diameter than the first male threaded part **120***a*.

The drag knob **121** includes a rotor **127** and a slider **128**. The rotor **127** is provided with a female threaded part **127***a* in a center part of the rotor **127**. The female threaded part **127***a* is engaged with the first male threaded part **120***a* of the drag shaft **120**. The slider **128** is provided with a through hole in a center part of the slider **128**. The through hole is penetrated by the drag shaft **120**. The slider **128** is mounted to the rotor **127** while being axially immovable and rotatable relatively to the rotor **127**. Additionally, the slider **128** is axially movable along the outer peripheral surface of the drag shaft **120** in conjunction with rotation of the rotor **127**.

It should be noted that the rotor **127** is provided with a recess **128***a* in a center part of the rotor **127** so as to dispose a fixation screw member **129** in the recess **128***a*. The fixation screw member **129** is screwed onto the second male threaded part **120***b* of the drag shaft **120**. The fixation screw member **129** prevents the drag knob **121** from being detached from the drag shaft **120**.

Each of the pair of bearing support members **123***a* and **123***b* includes a tubular part and a flange. The tubular part supports each bearing **118**. The flange has a disc shape and extends from one end of the tubular part to the outer peripheral side. Additionally, the drag washer **124***a* and a key washer **125***a* are disposed between the roller clutch **119** and one of the bearing support members **123***a* and **123***b* (i.e., the bearing support member **123***a*). On the other hand, the drag washer **124***b* and a key washer **125***b* are disposed between the roller clutch **119** and the other of the bearing support members **123***a* and **123***b* (i.e., the bearing support member **123***b*). Moreover, the disc springs **122** are disposed between the slider **128** of the drag knob **121** and the shaft support part **115***e* of the side plate **115**.

With the aforementioned construction, a drag force is adjustable by axially moving the slider **128** in conjunction with rotation of the drag knob **121**. The drag knob **121** is another example of a drag adjusting means.

Next, the seal mechanism **113** will be explained with FIG. **9**. The seal mechanism **113** includes a pair of O-rings **131** (first seal member), a second seal member **132** and a third seal member **133**. The seal members will be hereinafter explained in detail.

The construction of the pair of O-rings **131** is similar to that of the pair of O-rings **31** in the first preferred embodiment. Specifically, the support unit **105** is provided with annular grooves **105***c* and **105***d* on an outer peripheral surface of the support unit **105**, and the pair of O-rings **131** is disposed while being interposed between the annular grooves **105***c* and **105***d* and the inner peripheral surfaces of the first and second restriction members **111** and **112**, respectively. With this construction, water and/or so forth are blocked from intruding into the support unit **105** through gaps between the inner peripheral parts of the first and second restriction members **111** and **112** and the outer peripheral part of the support unit **105**. The pair of O-rings **131** is another example of the first sealing means.

The second seal member **132** is mounted to the outer peripheral surface of the shaft support part **115***e* of the side plate **115**. In other words, the shaft support part **115***e* is provided with an annular groove **115***i* on an outer peripheral surface of the shaft support part **115***e*. The second seal member **132** is mounted to the annular groove **115***i*. The second seal member **132** seals between the shaft support part **115***e* and the opening **111***a* of the first restriction member **111**. Accordingly, water and/or so forth are blocked from intruding into the support unit **105** through the opening **111***a* of the first restriction member **111**. The second seal member **132** is another example of a second sealing means.

The third seal member **133** is mounted to the first side end of the spool shaft **102**. In more detail, the spool shaft **102** is provided with a recess **102***d* on a first side end of the spool shaft **102**. The recess **102***d* is annularly recessed into the spool shaft **102**. The third seal member **133** is mounted to the recess **102***d*. The inner peripheral part of the third seal member **133** contacts the outer peripheral surface of the drag

shaft **120**. Additionally, the third seal member **133** is disposed while partially protruding from the recess **102***d*. Moreover, the end surface of the protruding part of the third seal member **133** contacts a brim **115***j* provided on the inner peripheral part of the shaft support part **115***e*. Accordingly, water and/or so forth are blocked from intruding into the support unit **105** through a gap between the spool shaft **102** and the drag shaft **120**. The third seal member **133** is another example of a third sealing means.

A fishing line winding action and a fishing line releasing action of the single-bearing reel according to the second preferred embodiment are similar to those of the single-bearing reel according to the first preferred embodiment, and will not be hereinafter explained.

Similarly to the first preferred embodiment, the first and second restriction members **111** and **112** engage with both ends of the male threaded parts **105***a* and **105***b* of the support unit **105** in the second preferred embodiment. Hence, the fishing line winding direction can be herein reversely changed by oppositely changing the attachment direction of the roller clutch **119**, i.e., the attachment direction of the support unit **105**.

When described in detail, the second restriction member **112** is firstly detached, and then, the spool **103** is detached from the support unit **105**. Next, the fixation screw member **129** and the drag knob **121** are detached, and the drag shaft **120** is pulled out. Then, the support unit **105** is detached from the spool shaft **102**. Next, the first restriction member **111** is detached, and the attachment direction of the support unit **105** is reversely changed. Then, the first restriction member **111** is attached. The attachment procedure to be hereinafter performed is only different from the detachment procedure in that the steps of the attachment procedure are performed reversely to those of the detachment procedure. Hence, its explanation will not be hereinafter explained.

Other Preferred Embodiments

The present disclosure is not limited to the aforementioned preferred embodiments, and a variety of changes or modifications can be made without departing from the scope of the present disclosure.

What is claimed is:

1. A single-bearing reel, comprising:
- a reel unit including a shaft support part;
- a spool shaft supported as a cantilever by the shaft support part;
- a support unit having a tubular shape, the support unit rotatable with respect to the spool shaft;
- a spool mounted to the support unit, the spool rotatable with respect to the spool shaft, a fishing line to be wound about an outer periphery of the spool;
- a first restriction member having an annular shape, the spool shaft penetrating through the first restriction member, the first restriction member at least partially mounted to an outer peripheral part of the support unit on a first end side of the support unit, the first restriction member restricting the spool from moving in an axial direction;
- a second restriction member having an annular shape, the spool shaft penetrating through the second restriction member, the second restriction member at least partially mounted to the outer peripheral part of the support unit on a second end side of the support unit, the second restriction member restricting the spool from moving in the axial direction;
- a pair of first seal members disposed on an outer peripheral surface of the support unit, one of the pair of first seal members sealing between the support unit and the first restriction member, the other of the pair of first seal members sealing between the support unit and the second restriction member;
- a second seal member sealing an inner peripheral part of the support unit from an inner peripheral part of the first restriction member; and
- a third seal member sealing the inner peripheral part of the support unit from an inner peripheral part of the second restriction member.

2. The single-bearing reel according to claim **1**, further comprising:
- a drag mechanism including a drag knob for adjusting a drag force, the drag knob disposed on an inner peripheral side of the second restriction member, wherein
- the third seal member seals between the inner peripheral part of the second restriction member and an outer peripheral part of the drag knob.

3. The single-bearing reel according to claim **1**, wherein the second seal member seals between the inner peripheral part of the first restriction member and an outer peripheral part of the shaft support part.

4. The single-bearing reel according to claim **1**, wherein
- the spool includes a boss having a tubular shape,
- the support unit is disposed inside of the boss, and
- the boss is interposed between the first restriction member and the second restriction member and is restricted from moving in the axial direction by the first restriction member and the second restriction member.

5. The single-bearing reel according to claim **1**, wherein the pair of first seal members is a pair of O-rings.

6. The single-bearing reel according to claim **1**, wherein the support unit includes a pair of bearings and a roller clutch, and the pair of bearings support the spool, the roller clutch disposed between the pair of bearings, the roller clutch configured to transmit or block a rotation of the spool along a rotational direction of the spool.

7. The single-bearing reel according to claim **1**, wherein the spool includes a plurality of through holes.

8. The single-bearing reel according to claim **1**, further comprising:
- a rotor including a recess;
- a fixation screw disposed in the recess and on an axial end of the spool shaft; and
- a fourth seal member sealing between the rotor and the fixation screw.

9. A single-bearing reel, comprising:
- a reel unit including a shaft support part;
- a spool shaft supported as a cantilever by the shaft support part;
- a support unit having a tubular shape, the support unit rotatable with respect to the spool shaft;
- a spool mounted to the support unit, the spool rotatable with respect to the spool shaft a fishing line to be wound about an outer periphery of the spool;
- a drag shaft penetrating an interior of the shaft support part and an interior of the spool shaft;
- a first restriction member having an annular shape, the spool shaft penetrating through the first restriction member, the first restriction member at least partially mounted to an outer peripheral part of the support unit on a first end side of the support unit, the first restriction member restricting the spool from moving in an axial direction;

a second restriction member having a closed-end cylindrical shape, the second restriction member at least partially mounted to the outer peripheral part of the support unit on a second end side of the support unit, the second restriction member restricting the spool from moving in the axial direction;

a pair of first seal members disposed on an outer peripheral surface of the support unit, one of the pair of first seal members sealing between the support unit and the first restriction member, the other of the pair of first seal members sealing between the support unit and the second restriction member;

a second seal member sealing an inner peripheral part of the support unit from an inner peripheral part of the first restriction member; and

a third seal member sealing between an inner peripheral part of the spool shaft and an outer peripheral part of the drag shaft.

10. The single-bearing reel according to claim **9**, wherein the second seal member seals between the inner peripheral part of the first restriction member and an outer peripheral part of the shaft support part.

11. The single-bearing reel according to claim **9**, wherein

the spool includes a boss having a tubular shape,

the support unit is disposed inside of the boss, and

the boss is interposed between the first restriction member and the second restriction member and is restricted from moving in the axial direction by the first restriction member and the second restriction member.

12. The single-bearing reel according to claim **9**, wherein the pair of first seal members is a pair of O-rings.

13. The single-bearing reel according to claim **9**, wherein the support unit includes a pair of bearings and a roller clutch, the pair of bearings supports the spool, the roller clutch disposed between the pair of bearings, the roller clutch configured to transmit or block a rotation of the spool along a rotational direction of the spool.

14. The single-bearing reel according to claim **9**, wherein the spool includes a plurality of through holes.

15. A single-bearing reel, comprising:

a spool shaft;

a reel unit including shaft supporting means for supporting the spool shaft;

a spool;

spool supporting means for rotatably supporting the spool with respect to the spool shaft;

first restricting means for restricting the spool from moving in an axial direction;

second restricting means for restricting the spool from moving in the axial direction;

first sealing means for sealing between the spool supporting means and the second restricting means;

second sealing means for sealing an inner peripheral part of the spool supporting means from an inner peripheral part of the first restricting means;

third sealing means for sealing the inner peripheral part of the spool supporting means from an inner peripheral part of the second restricting means; and

drag adjusting means for adjusting a drag force, the third sealing means sealing between the inner peripheral part of the second restricting means and an outer peripheral part of the drag adjusting means.

16. The single-bearing reel according to claim **15**, wherein

the spool includes a boss having a tubular shape,

the spool supporting means is disposed inside of the boss, and

the boss is interposed between the first restricting means and the second restricting means and is restricted from moving in the axial direction by the first restricting means and the second restricting means.

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